Report of an Association between Race and Thyroid Stimulating Hormone Level

ABSTRACT

We examined the association between race and thyroid stimulating hormone (TSH) level in 809 consecutive Black or White adults tested for mild suspicion of hypothyroidism with a normal TSH result. The mean TSH level of Blacks was 0.4 (SE .053) mU/L lower than that for Whites after age and sex adjustment, race explaining 6.5 percent of the variation in TSH levels. A validation sample yield similar results. This finding supports the possibility that differences in thyroid function and/or regulation may be associated with race. (*Am J Public Health* 1991;81:505–506)

Joel M. Schectman, MD, MPH, Gene A. Kallenberg, MD, Robert P. Hirsch, PhD, and Ronald J. Shumacher, MD

Introduction

In two recent reports the incidental finding of an association between race and primary hypothyroidism has been noted.[1,2] The odds of both borderline and substantial thyroid stimulating hormone (TSH) elevations were greater among Whites than Blacks, controlling for age and sex. An increased risk of autoimmune thyroiditis among Whites has also been mentioned in thyroid textbooks,[3,4] but supported mainly by old hospital prevalence studies[5,6] with biases likely favoring detection of disease among Whites. Age and sex associations for primary hypothyroidism and autoimmune thyroiditis are well accepted, with previous studies documenting corresponding age and sex associations with TSH levels as well.[7–9] We hypothesized that a similar association would be found between race and TSH levels if there were a substantial racial association for hypothyroidism and autoimmune thyroiditis.

Methods

Subjects were consecutive adult primary care patients of the George Washington University Health Plan that had a TSH level for suspicion of hypothyroidism due to nonspecific symptoms or signs from April 1985 to March 1987. Patients on medications known to affect thyroid function tests or with a history of thyroid disease were excluded. Of 880 such patients identified, 33 were excluded due to an abnormal TSH level and 38 because either no race or one other than Black or White was noted in the medical record. This analysis is restricted to the remaining 809 Black or White patients tested for suspicion of hypothyroidism and found to have TSH levels within normal limits. Categorization of race was generally by patient self-report on the data base form in the chart. The racial demographics of this sample were similar to those of the entire health plan patient population.

The Magic TSH RIA (CIBA Corning Magnetic Immunochemistries, Medfield, MA) with normal limits of 0–5 mU/L was utilized for all TSH determinations obtained during the initial study period. A linear regression analysis was used to test for an association between race and TSH level. The model utilized TSH as the dependent variable, with age, sex, and race as independent variables, and chronic medical problems and/or medication use (both treated as dichotomous variables) as potential confounding factors. An analysis utilizing a log transformation of TSH to normalize the skewed distribution yielded similar results. Interactions between the independent variables were evaluated and a P-value of 0.10 or less was required to remain in the final model in a stepwise procedure.

In August 1989, a validation sample of 97 patients with normal TSH levels was collected at the study site by the same methods. The sample size was calculated to assure a 90 percent power of detecting a 0.4 mU/L difference in mean TSH levels at a 0.05 level of significance. The Magic mab TSH (CIBA Corning Magnetic Immunochemistries), an immunoradiometric sandwich assay with normal limits of 0.3–4.5 mU/L, was utilized for the TSH determinations on this patient sample. The analysis proceeded as described above.

Results

Of the patients from the initial study sample, 406 were Black and 403 were White. The interaction terms did not achieve a P-value of 0.10 or less and were thus eliminated from the final model. Chronic medical conditions and medica-

From the George Washington University Medical Center (Schectman, Kallenberg, Hirsch) and the Georgetown University Hospital (Shumacher). Address reprint requests to Joel M. Schectman, MD, MPH, Department of Health Care Sciences, George Washington University Medical Center, 2150 Pennsylvania Avenue, NW, Rm 2B-420, Washington, DC 20037.

This paper, submitted to the Journal March 8, 1990, was revised and accepted for publication August 6, 1990.

TABLE 1—Linear Regression Model of TSH as a Function of Race

Variables	Sample	Coefficient	Standard Error	P-value
Age*	Initial	0.007	0.002	0.004
	Validation	0.006	0.006	0.32
Sex**	Initial	−0.081	0.074	0.27
	Validation	−0.45	0.23	0.06
Race***	Initial	0.402	0.053	<0.0001
	Validation	0.45	0.18	0.01

*In years.
**Coded: female = 0, male = 1.
***Coded: Black = 0, White = 1.

tion use were not significantly associated with TSH levels. Age and race, but not sex, were independently predictive of TSH levels within the normal range (Table 1). Race explained 6.5 percent and age 0.8 percent of the variation in TSH levels. Whites had an age- and sex-adjusted mean TSH level 0.4 mU/L higher than Blacks.

Of the 97 patients in the validation sample, 51 were Black and 46 were White. The regression analysis again reveals an association between TSH level and race independent of sex and age. Race explained 5.5 percent of the variation in TSH levels with Whites having an age- and sex-adjusted mean TSH level 0.45 mU/L higher than Blacks.

Discussion

The present analysis reveals a racial association for TSH levels within the normal range in a population of primary care patients tested for generally mild suspicion of thyroid disease. The fairly large mean difference in TSH levels between Blacks and Whites in the two samples suggests that this association may be of clinical importance and is consistent with previously reported findings of a higher prevalence of borderline and frankly elevated TSH levels in Whites.[1,2] The association between race and TSH level was much stronger than that for age or sex, factors known to be associated with TSH level. An older sample would likely have demonstrated a greater age and sex dependency, however.

It is unlikely that these results are due to chance, given the highly significant P-value and the similar results obtained in the validation sample using the newer super-sensitive TSH assay.

It is possible that biased selection could account for these results since neither data set resulted from a random sampling of the population. This was necessary since, to our knowledge, no data base is available that contains race and TSH data for a normal reference population. However, for such a selection bias to have occurred, presumably euthyroid Whites with TSH levels higher in the normal range than Blacks (controlling for age and sex) must have been preferentially tested in both study samples. We are unaware of any reason for this to have occurred.

Several possible explanations of a racial association for normal TSH levels can be suggested. Environmental factors such as iodide consumption[4] might vary sufficiently between Blacks and Whites in the study population to affect thyroid function and account for the racial association. It is also possible that genetic factors differ between the Black and White patients tested and could account for a difference in TSH levels. Given previously determined relationships between race, gene frequency, and autoimmune disease,[10,11] such an association would not be surprising and has in fact been suggested by one study of post-partum thyroid dysfunction.[12] Population-based data are needed to confirm an association between race and thyroid function, as well as establish a link with antithyroid antibodies or other factors. Such information should be available from the NHANES III database in the future. □

Acknowledgment

The authors wish to acknowledge the thoughtful review of the manuscript made by Dr. Joshua Cohen.

References

1. Schectman JM, Kallenberg GA, Schumacher RJ, Hirsch RP: Yield of hypothyroidism in symptomatic primary care patients. Arch Intern Med 1989; 149:861–864
2. Bagchi N, Brown TR, Parish RF. Thyroid Dysfunction in Adults Over Age 55 Years. Arch Intern Med 1990; 150:785–87.
3. Fisher DA, Beall GN: Hashimoto's thyroiditis. *In:* Hershman JM, Bray GA (eds): The Thyroid, Physiology and Treatment of Disease. International Encyclopedia of Pharmacology and Therapeutics, Sec. 101. Oxford: Pergamon Press, 1979; 487.
4. Ingbar SH, Braverman LE (eds): Werner's The Thyroid. A Fundamental and Clinical Test, 5th Ed. Philadelphia: J.B. Lippincott, 1986; 1270.
5. Masi AT. Hashimoto's disease: an epidemiological study based on a community-wide hospital survey. J Chron Dis. 1965; 18:35–57.
6. Statland H, Wasserman MM, Vickery AL. Struma lympomatosa (Hashimoto's struma). Arch Intern Med. 1951; 88:659–665.
7. Tunbridge WMG, Evered DC, Hall R, Appleton D, Brewis M, Clark F, Evans Grimley J, Young E, Bird T, Smith PA: The spectrum of thyroid disease in a community: The Whickham Survey. Clin Endocrinol 1977; 7:481–493.
8. Gordin A, Maatela J, Miettinen A, Helenius T, Lamberg BA: Serum thyrotrophin and circulating thyroglobulin and thyroid microsomal antibodies in a Finnish population. Acta Endocr 1979; 90:33–42.
9. Nystrom E, Bengtsson C, Lindquist O, Noppa H, Lindstedt G, Lundberg P: Thyroid disease and high concentration of serum thyrotrophin in a population sample of women. Acta Med Scand 1981; 210:39–46.
10. Grumet FC: HLA and disease. Clin Immunol Rev 1983; 2(1):123–155.
11. Farid NR, Bear JC: The human major histocompatibility complex and endocrine disease. Endocrine Rev 1981; 2(1):50–86.
12. Hayslip CC, Fein HG, O'Donnell VM, Friedman DS, Klein TA, Smallridge RC. The value of serum antimicrosomal antibody testing in screening for symptomatic postpartum thyroid dysfunction. Am J Obstet Gynecol 1988; 159:203–9.